



299-E33-2 (A4846)

Log Data Report

Borehole Information:

Borehole: 299-E33-2 (A4846)		Site: 216-B-44 Crib			
Coordinates		GWL (ft)¹: 233.45	GWL Date: 12/14/01		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
137,641.56 m	573,617.22 m	Nov. 1954	630.62 ft	243	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	3.3	8.625	8.0	0.3	+3.3	234.5
Steel Welded	3.2	4.5	4.0	0.25	+3.2	210

Borehole Notes:

Groundwater level was measured prior to logging. The HPT's borehole swab did not detect contamination from inside the casing.

The logging engineer measured the casing stick up and thickness using an engineer's tape and caliper. Casing bottom is reported from information provided on the as-built drawing (HWIS³) for this borehole.

Borehole TV scans on 11/07/89 and 09/20/90 (HWIS) indicated open hole below 8-in. casing at 230 to 233 ft (ground level reference), and 4-in. casing to 215 ft.

Logging Equipment Information:

Logging System: Gamma 1D	Type: SGLS (35%)
Calibration Date: 07/01	Calibration Reference: GJO-2001-243-TAR
Logging Procedure: MAC-HGLP 1.6.5, Rev 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5	6
Date	12/28/01	12/28/01	12/28/01	1/02/02	1/03/02	1/07/02
Logging Engineer	Kos	Kos	Kos	Kos	Kos	Kos
Start Depth (ft)	238.0	236.0	201.0	95.0	50.0	3.5
Finish Depth (ft)	200.0	216.0	190.0	192.0	98.0	55.0
Count Time (sec)	200	200	200	200	200	200
Live/Real	R	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0	1.0
ft/min	N/A ⁴	N/A	N/A	N/A	N/A	N/A

Log Run	1	2	3	4	5	6
Pre-Verification	A0066CAB	A0066CAB	A0066CAB	A0067CAB	A0068CAB	A0069CAB
Start File	A0066000	A0066039	A0066060	A0067000	A0068000	A0069000
Finish File	A0066038	A0066059	A0066071	A0067097	A0068048	A0069052
Post-Verification	A0066CAA	A0066CAA	A0066CAA	A0067CAA	A0068CAA	A0069CAA
Depth Return Error (in.)	N/A	N/A	0	-2	-0.875	-0.625
Comments	No fine-gain adjustments made.	Repeat section. No fine-gain adjustments made.	No fine-gain adjustments made.	No fine-gain adjustments made.	No fine-gain adjustments made.	No fine-gain adjustments made.

Logging Operation Notes:

Zero reference is the top of casing.

Logging was performed without a centralizer on the sonde, because the borehole diameter is too small. The bottom of the 4-in. casing appears to be at or near 209 ft. ¹³⁷Cs and ⁶⁰Co were identified during logging. A data overlap occurs from 50 to 55.5 ft.

Analysis Notes:

Analyst:	Sobczyk	Date:	01/28/02	Reference:	MAC-VZCP 1.7.9 Rev. 2
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Pre-run and post-run verification spectra were collected at the beginning and end of each day. The recorded peak counts per second (cps) for the 609-keV peak, 1461-keV peak, and 2615-keV peak were consistently lower each day in the post-run verification as compared to the pre-run verification. This change varied from 7 to 12 percent. The cause of this discrepancy is being investigated. Evaluation of the spectra indicates that the detector is functioning normally, and the log data are provisionally accepted, subject to further review and analysis. The post-run verification spectra were used to provide the energy and resolution calibration for processing the data using APTEC SUPERVISOR.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify specific energy peaks and determine net count rates. Concentrations were calculated in EXCEL (source file: G1DCALC4.xls), using calibration coefficients from June 2001. Zero reference is the top of the casing. On the basis of the As-Built diagram and the observations of the logging engineer, the casing configuration was assumed to be a string of 8-in. casing with a thickness of 0.3125 in. to a log depth of 209 ft and a string of 4-in. casing with a thickness of 0.25 in. to a log depth of 238 ft. Where more than one casing exists at a depth, the casing correction is additive (e.g., an 8-in. and 4-in. casing would be the correction for $0.3125 + 0.25 = 0.5625$). A water correction was applied at and below 235 ft.

Dead time corrections are required when dead time exceeds 10.5 percent. Dead time exceeded 10.5 percent in the interval from about 51 to 62 ft. Maximum dead time was about 38 percent at 52 ft.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (⁴⁰K, ²³⁸U, and ²³²Th), and man-made radionuclides. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. In addition, comparison log plots of man-made radionuclides are provided that compare data collected with Westinghouse Hanford Company's Radionuclide Logging System (RLS) with SGLS data. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. A combination plot is also

included to facilitate correlation. The repeat log plot demonstrates good repeatability of the SGLS data for both the man-made and naturally occurring radionuclides.

Results and Interpretations:

^{137}Cs and ^{60}Co are the predominant contaminants, with minor amounts of ^{154}Eu and ^{152}Eu . A significant interval of ^{137}Cs occurs between 49 and 73 ft, with maximum concentrations on the order of 1,200 to 1,400 pCi/g between 51 and 61 ft. ^{154}Eu also occurs within this interval, with concentrations up to about 4.5 pCi/g between 51 and 63 ft. ^{152}Eu was detected at 56 ft, at a concentration of less than 1 pCi/g. A second significant interval of ^{137}Cs occurs between 216 and 224 ft, with concentrations up to 26 pCi/g. Minor intervals of ^{137}Cs were also detected at 4 to 7 ft and 209 to 211 ft, with scattered occurrences at less than 1 pCi/g between 80 and 171 ft. ^{60}Co occurs almost continuously from 60 ft to total depth at 238 ft. Concentrations are generally on the order of 1 pCi/g. A maximum value of 8.8 pCi/g occurs at a depth of 230 ft. ^{60}Co occurs below the groundwater level at concentrations up to 4 pCi/g.

Significant changes in apparent ^{40}K activities occur at about 18, 51, 137, 209, and 221 ft. The relatively high concentrations of ^{137}Cs below about 51 ft appear to correspond with the increase in ^{40}K activities and the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

Comparison log plots of data collected in 1991 and 1996 by Westinghouse Hanford Co. (WHC) and 2002 by MACTEC-ERS are included. The WHC concentration data (^{154}Eu , ^{137}Cs , and ^{60}Co) were decayed to the date of the SGLS logging event in January 2002. The comparisons show good agreement between the logging systems for the man-made radionuclides. There did not appear to be any significant changes in the contaminant profile that would suggest contaminant movement in the vadose zone over the last ten years.

¹ GWL – groundwater level

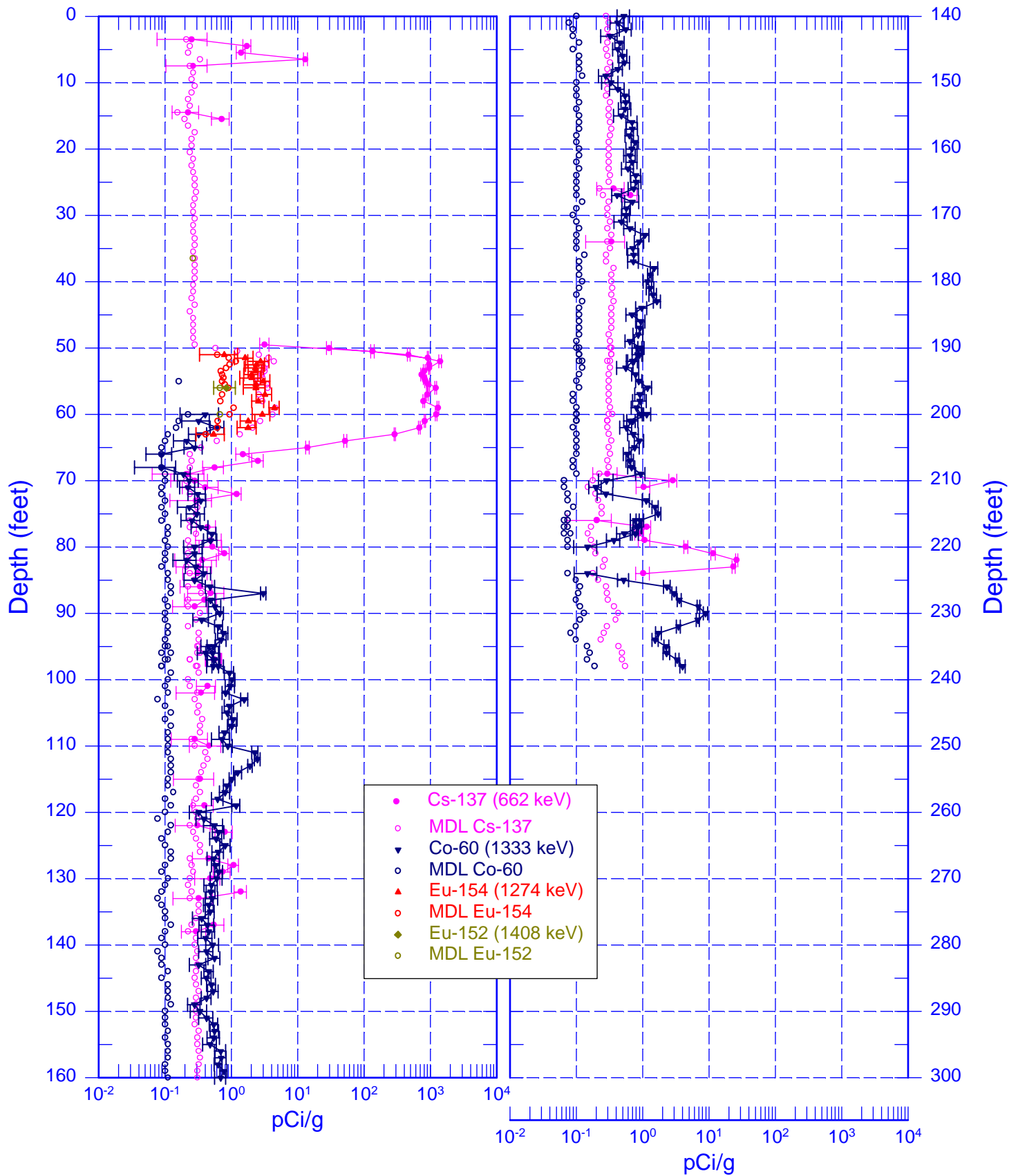
² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – Not applicable

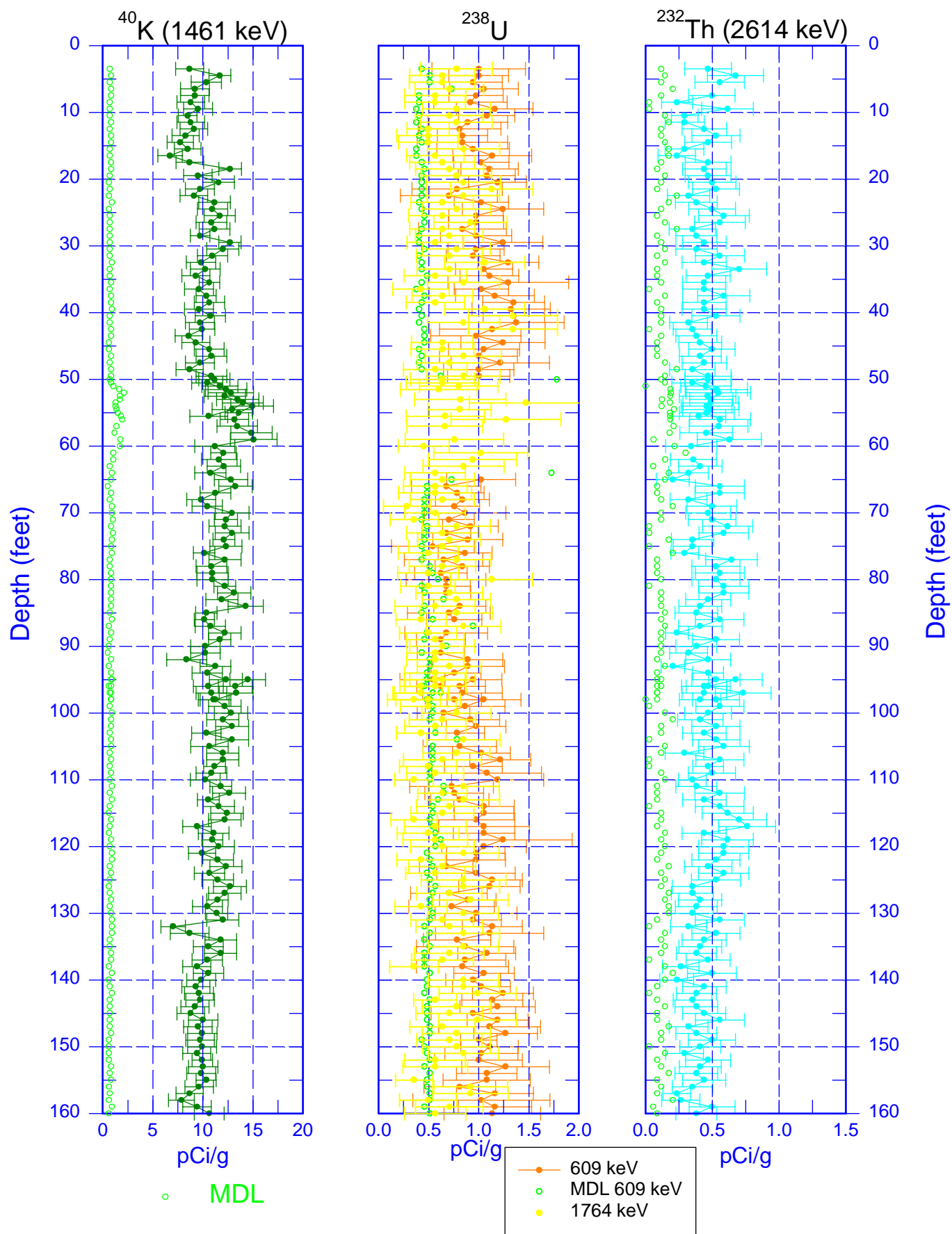
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Man-Made Radionuclides



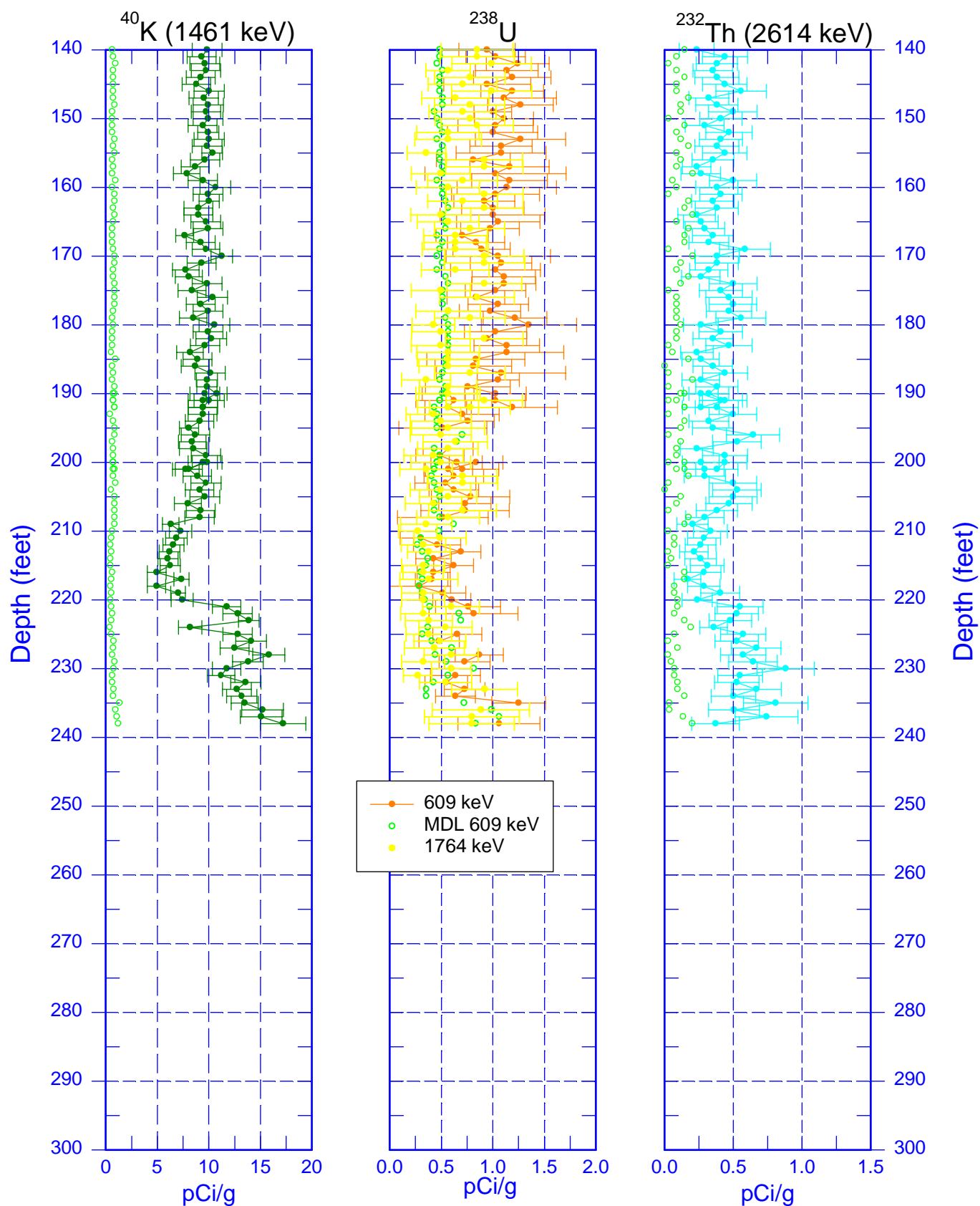
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Natural Gamma Logs

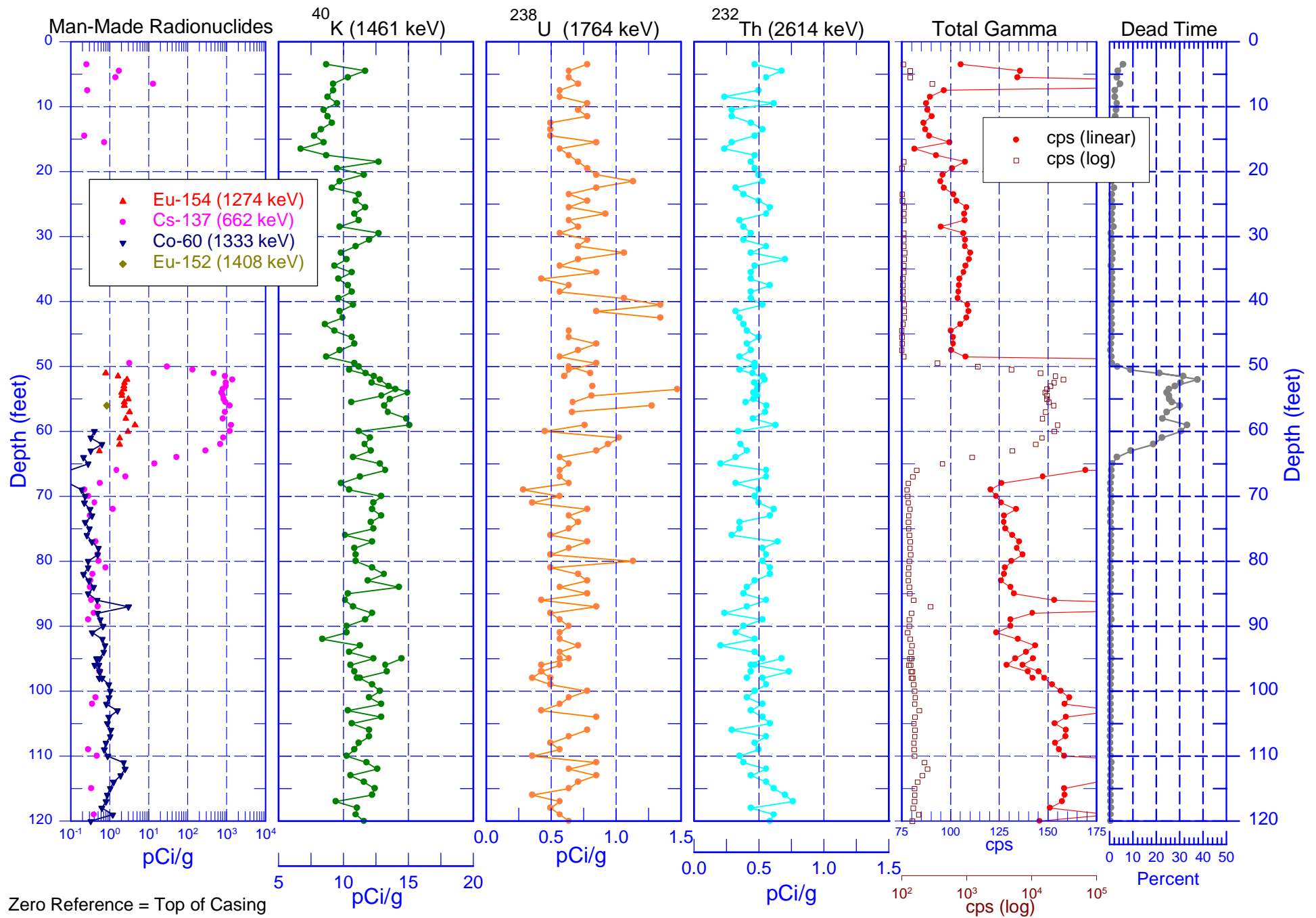


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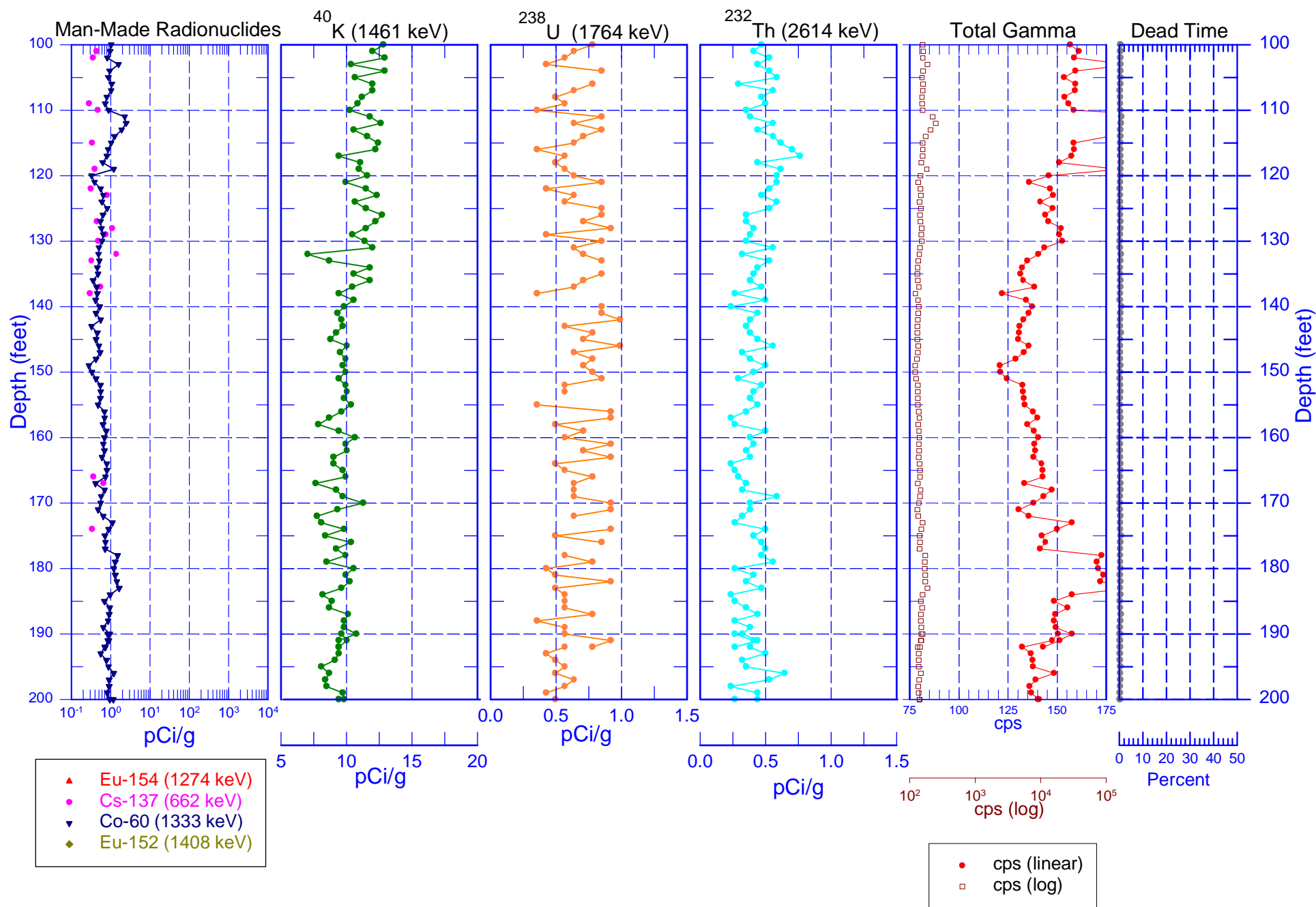
Natural Gamma Logs



299-E33-2 (A4846) Combination Plot

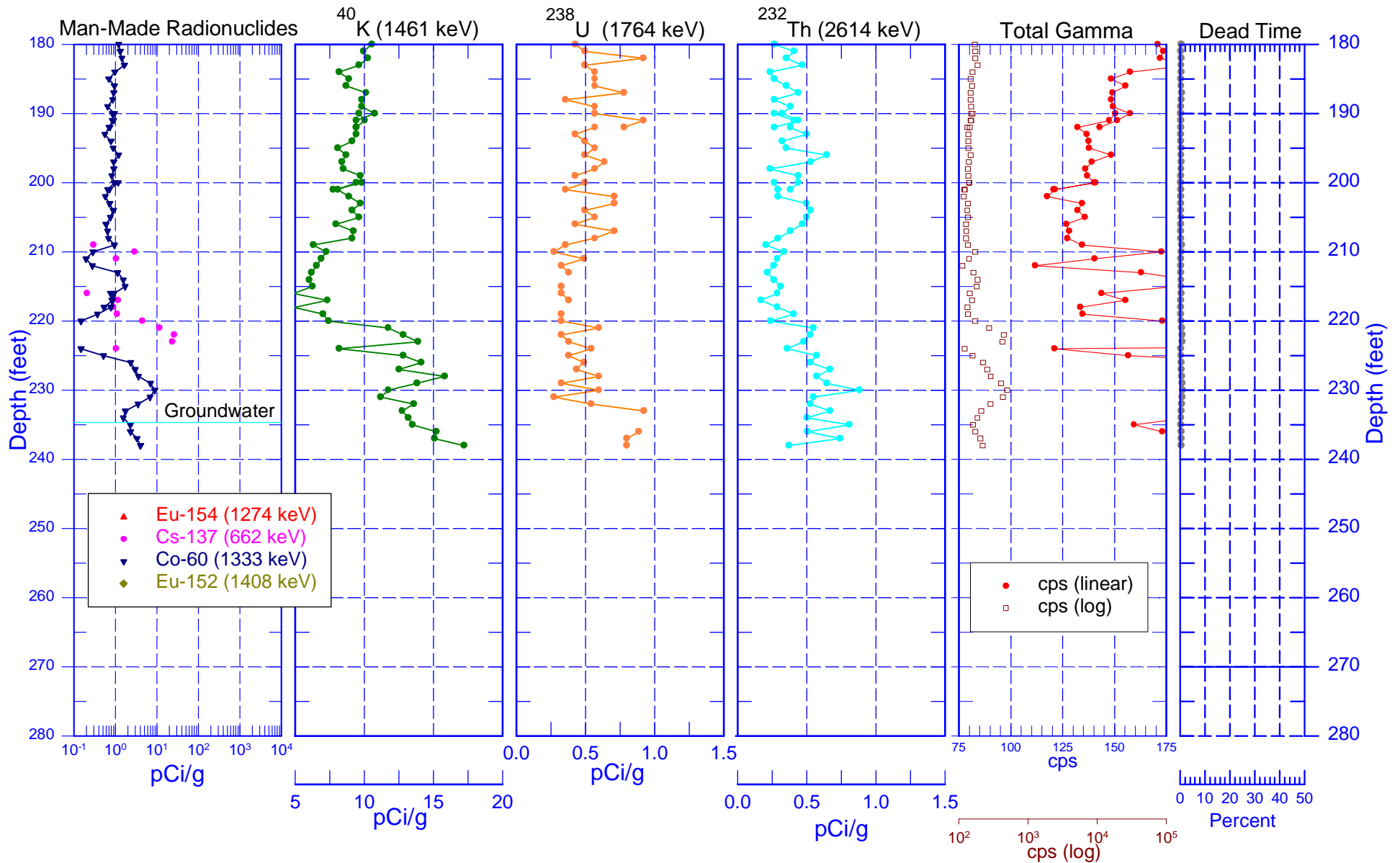


299-E33-2 (A4846) Combination Plot



Zero Reference = Top of Casing

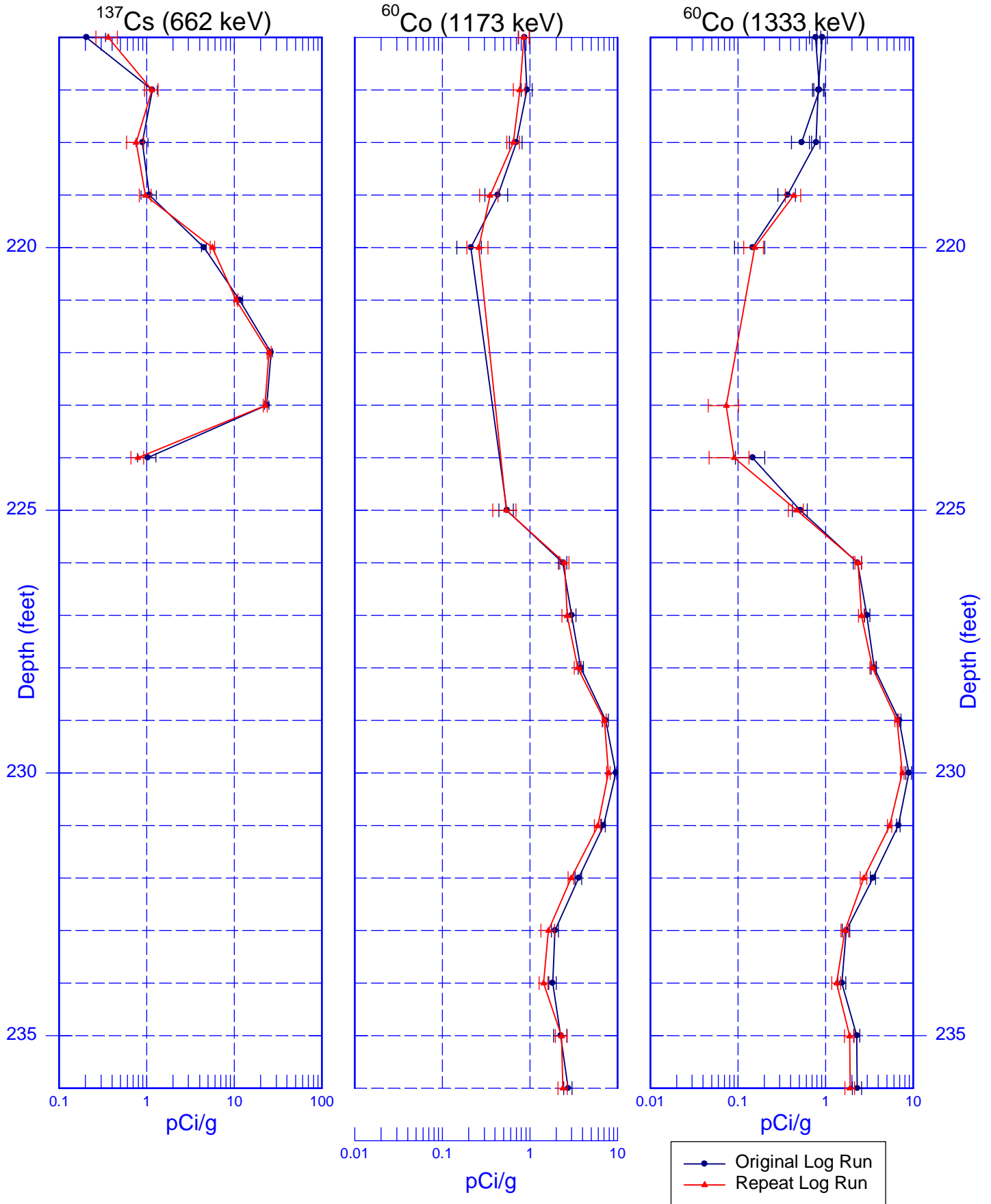
299-E33-2 (A4846) Combination Plot



Zero Reference = Top of Casing

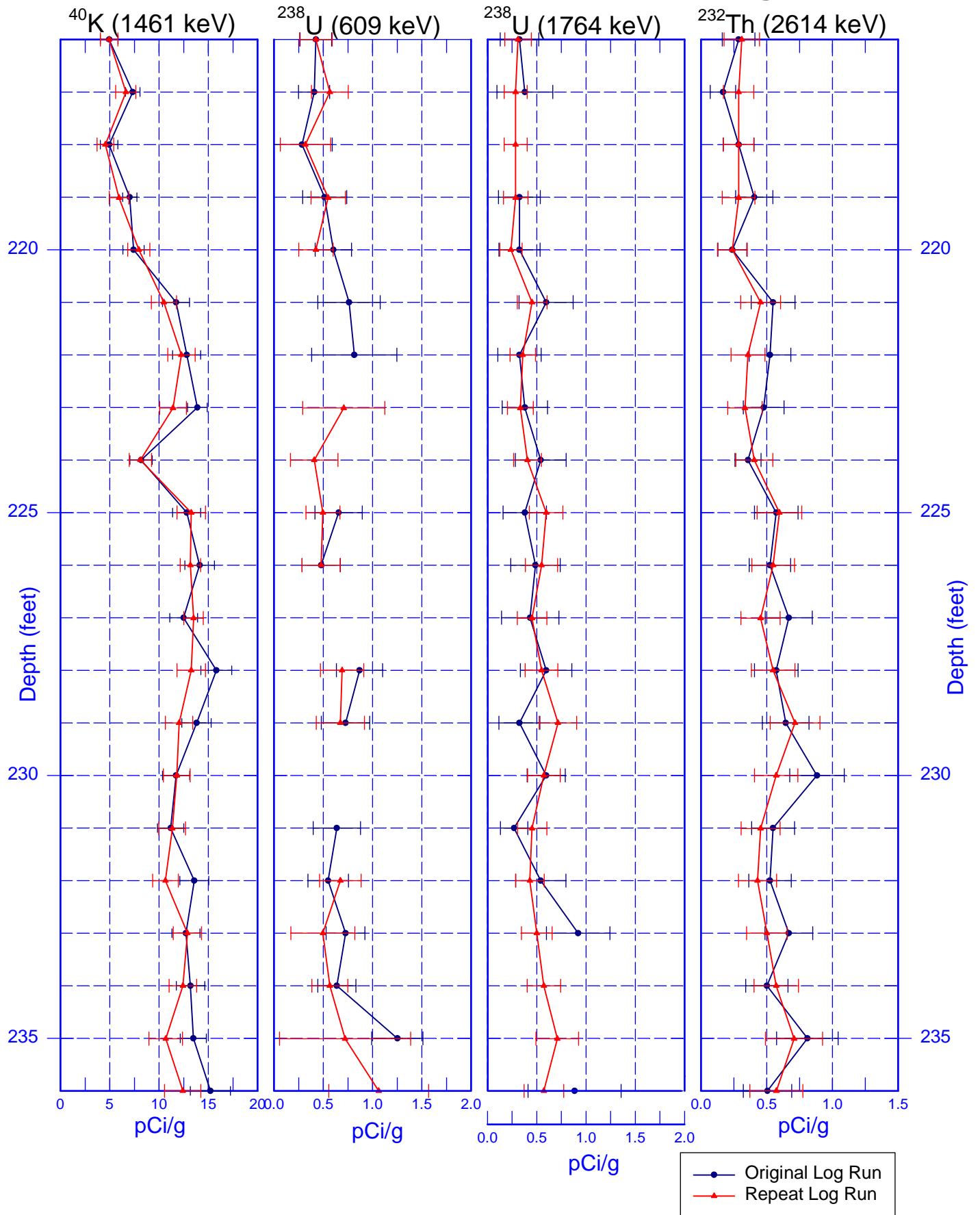
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Repeat Section of Man-Made Radionuclides (216-236 ft)



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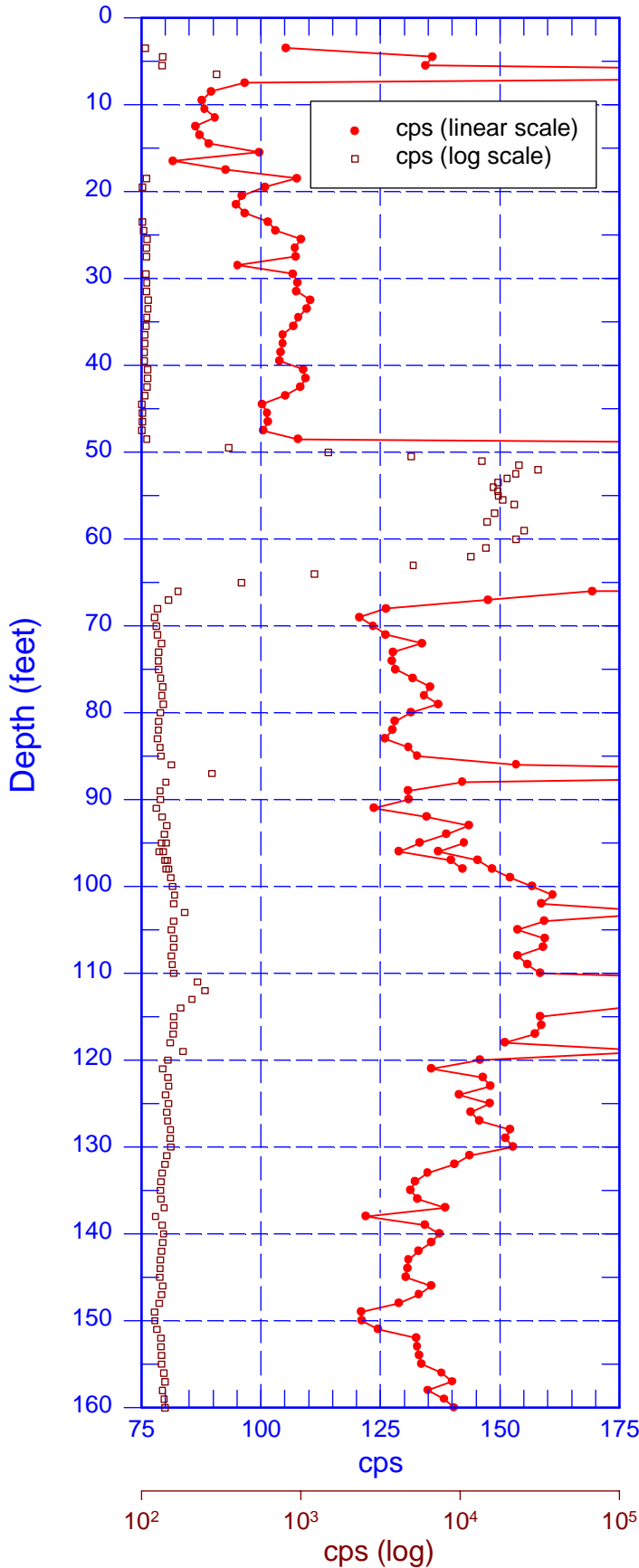
Repeat Section of Natural Gamma Logs



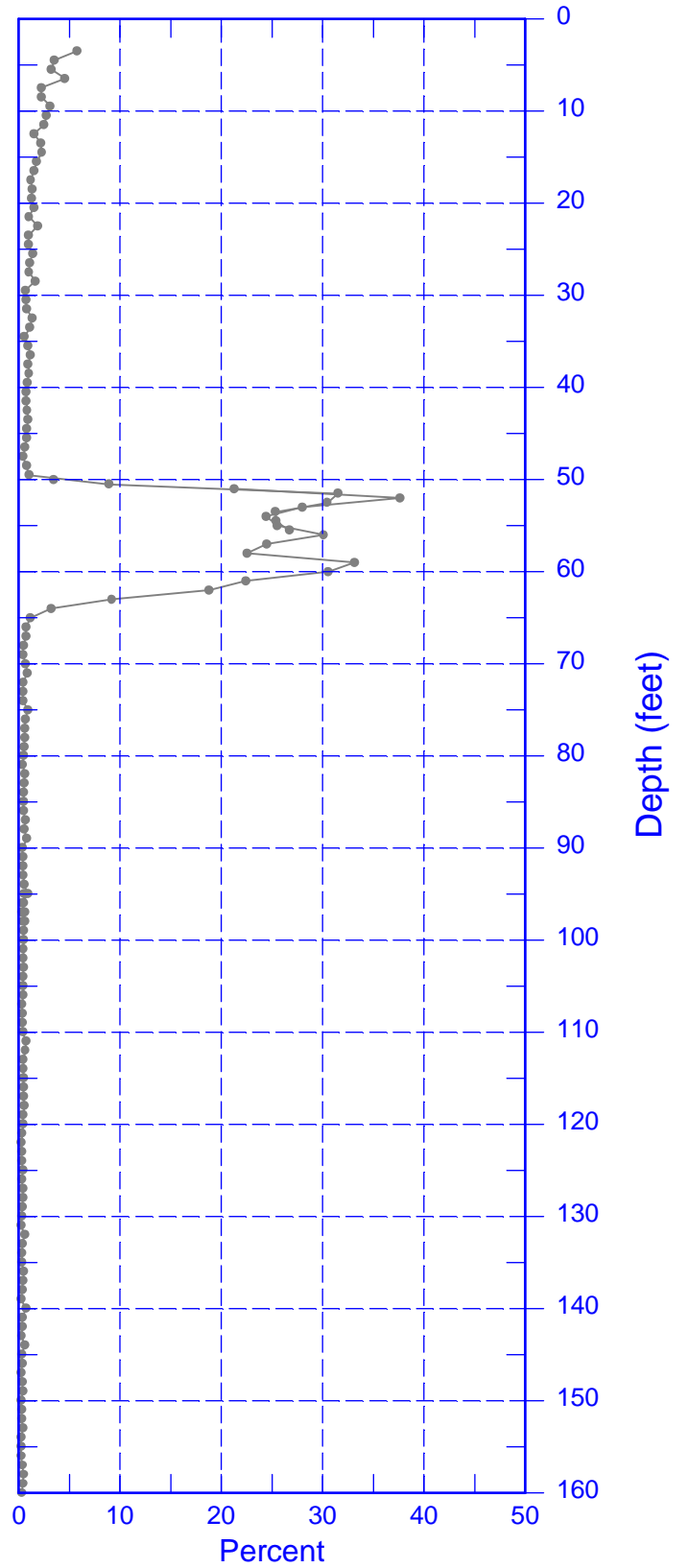
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Total Gamma & Dead Time

Total Gamma

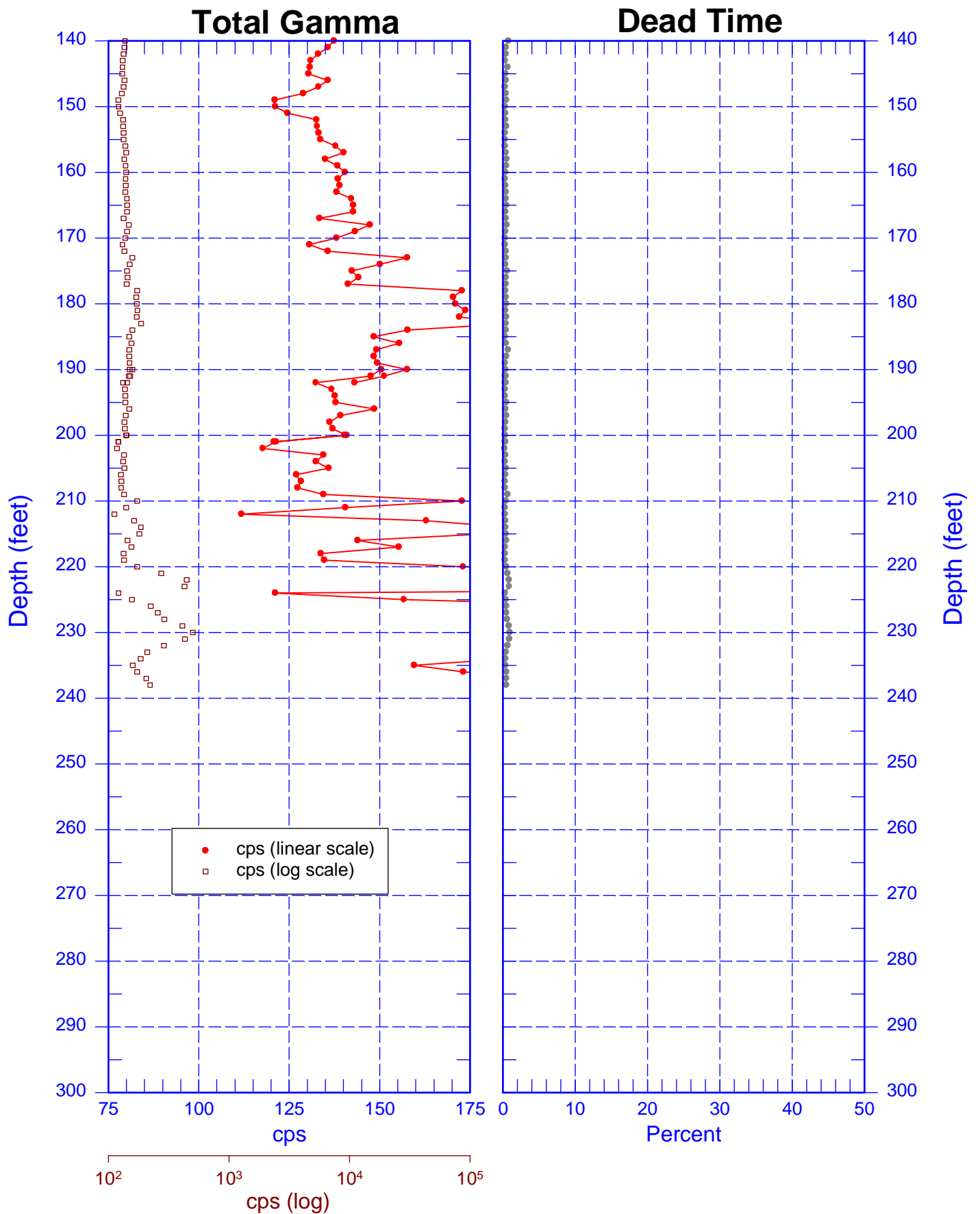


Dead Time



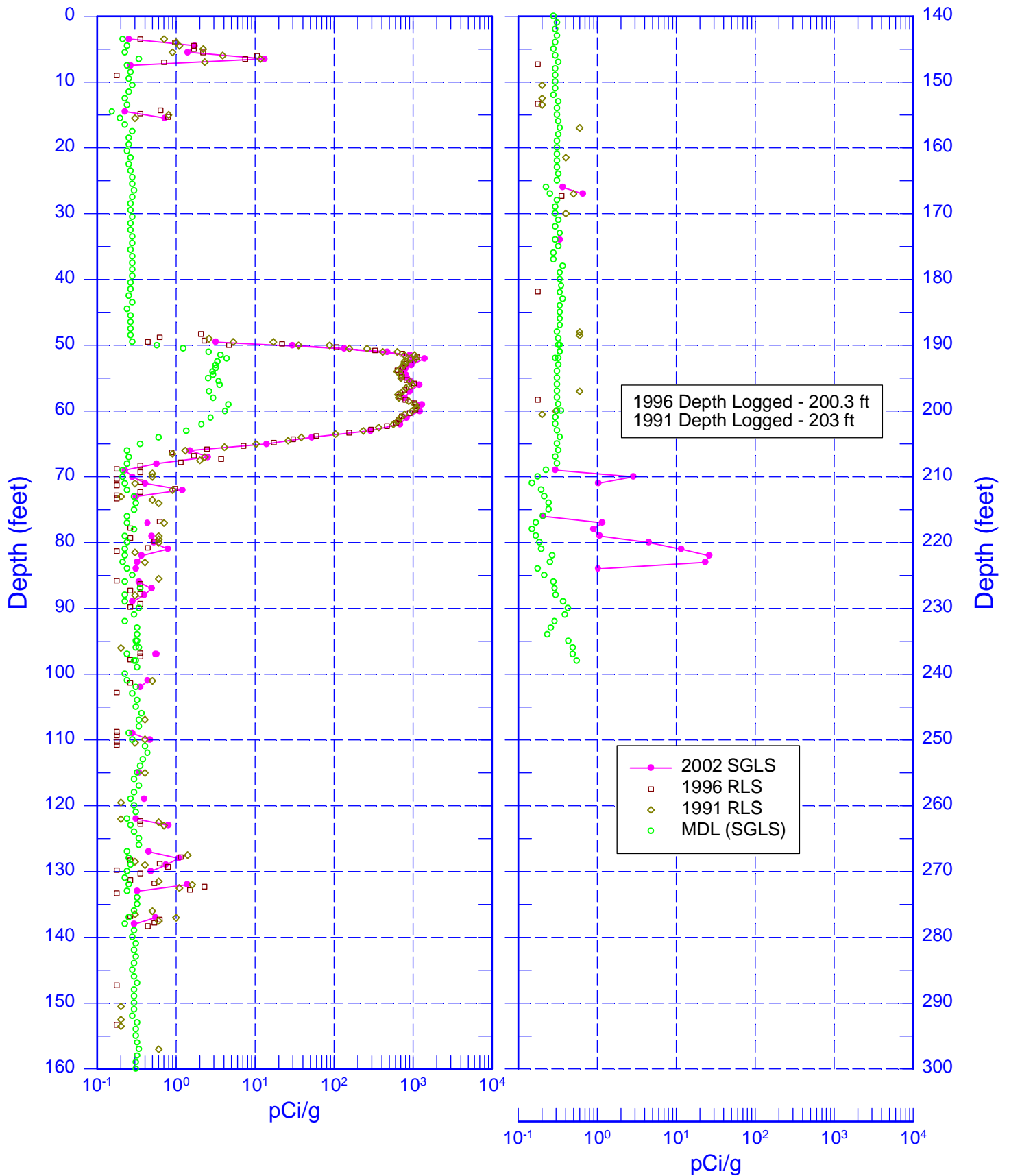
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Total Gamma & Dead Time



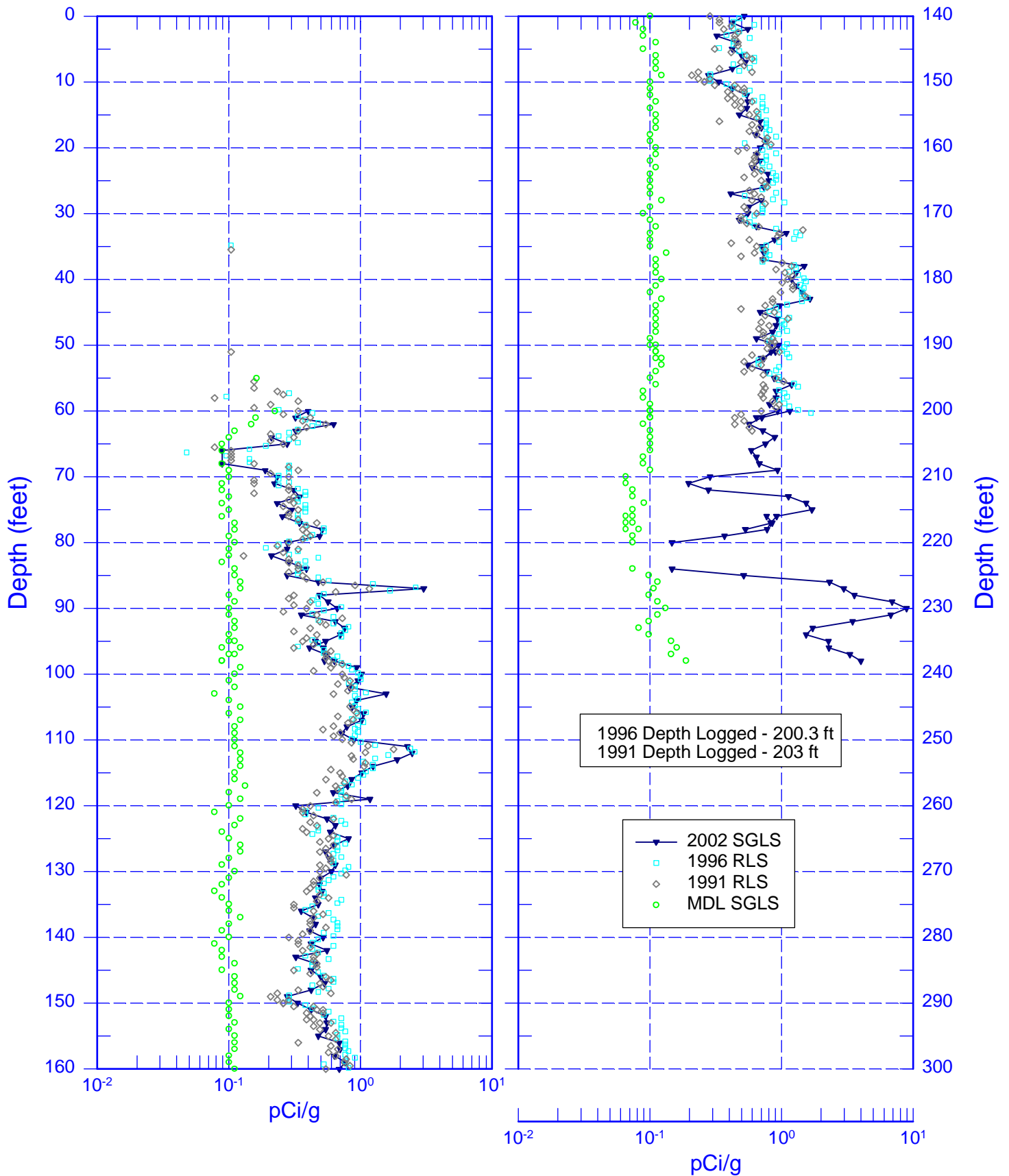
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RLS Data Compared to SGLS Data
¹³⁷Cesium Decayed to 01/03/2002



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RLS Data Compared to SGLS Data
⁶⁰Cobalt Decayed to 01/03/2002



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RLS Data Compared to SGLS Data
¹⁵⁴Europium Decayed to 01/03/2002

